ORIGINAL RESEARCH ARTICLE

Determinants of life expectancy in China: A comparative analysis of economic and non-economic factors

DOI: 10.29063/ajrh2025/v29i3.18

Congxin Fan[1] and Le Bo[2]*

Department of Regional Economic Development, Party School of Liaoning provincial Party Committee, ShenYang 110000, China[1]; Department of Emergency Management, Party School of Liaoning provincial Party committee, ShenYang 110000, China[2]

***For Correspondence:** Email: *Fancy92811@163.com*

Abstract

This study investigated the determinants (economic and non-economic) of life expectancy in China from 2000 to 2020, focusing on economic development, income inequality, environmental quality, and health facilities. Using graphical analyses, the study identifies trends and patterns that illustrate the relationship between these factors and life expectancy. Findings suggest that robust economic growth from 2000 to 2005 significantly enhanced healthcare infrastructure, living standards, and access to essential services, driving early improvements in LE. Despite declining economic growth and employment rates after 2010, LE continued to rise, reflecting the long-term impact of prior investments in healthcare and public health systems. The unexpected coexistence of rising CO_2 emissions and increasing life expectancy points to the mitigating role of healthcare and social services against environmental degradation. Additionally, improved health infrastructure, particularly hospital bed availability, emerged as a critical driver of LE growth, addressing the needs of an aging population and reducing mortality rates. *(Afr J Reprod Health 2025; 29 [3]: 160-167).*

Keywords: Life expectancy; health; economic; non-economic; China

Résumé

Cette étude a examiné les déterminants (économiques et non économiques) de l'espérance de vie en Chine de 2000 à 2020, en se concentrant sur le développement économique, les inégalités de revenus, la qualité de l'environnement et les établissements de santé. À l'aide d'analyses graphiques, l'étude identifie des tendances et des modèles qui illustrent la relation entre ces facteurs et l'espérance de vie. Les résultats suggèrent qu'une croissance économique robuste entre 2000 et 2005 a considérablement amélioré les infrastructures de soins de santé, le niveau de vie et l'accès aux services essentiels, entraînant ainsi des améliorations précoces en matière d'économie locale. Malgré le déclin de la croissance économique et des taux d'emploi après 2010, le LE a continué de croître, reflétant l'impact à long terme des investissements antérieurs dans les soins de santé et les systèmes de santé publique. La coexistence inattendue de l'augmentation des émissions de CO_2 et de l'augmentation de l'espérance de vie souligne le rôle atténuant des services de santé et des services sociaux contre la dégradation de l'environnement. En outre, l'amélioration des infrastructures de santé, en particulier la disponibilité de lits d'hôpitaux, est apparue comme un moteur essentiel de la croissance de l'économie locale, répondant aux besoins d'une population vieillissante et réduisant les taux de mortalité. *(Afr J Reprod Health 2025; 29 [3]:160-167).*

Mots-clés: Espérance de vie; santé; économique; non économique; Chine

Introduction

Health is the foundation of human development, and the pursuit of longer, high-quality lives remains a universal goal[1,2]. Life expectancy (LE), a critical indicator of population health, reflects the overall health conditions of a society and serves as a benchmark for policy development and public health improvement[3-5].

Explained as the amount of years a new baby is expected to be alive under prevailing age-specific mortality rates[6,2], LE offers insights into the effectiveness of economic, social, and health interventions. Over the past 30 years, LE has risen steadily in many countries, reflecting advancements in healthcare, living conditions, and economic stability. In highly developed nations, LE exceeds 75 years, whereas in underdeveloped regions, it often falls below 50 years, illustrating disparities in health outcomes globally[7,8]. China has experienced significant progress in LE over recent decades, fuelled by rapid economic development and

enhanced living standards. Between 2000 and 2017, China's LE increased from 71.40 years to 76.47 years, a remarkable improvement considering its historical context[9,3]. Just 30 years before 2000, LE in China was approximately 10 years lower, highlighting the impact of economic reforms, poverty alleviation efforts, and expanded healthcare access. Recognizing the importance of public health to national development, the Chinese government launched the "Healthy China 2030" initiative in 2016. This ambitious program aims to raise national LE to 79.0 years by 2030, emphasizing the government's commitment to improving population health through strategic interventions and equitable access to healthcare services[10, 11].

Despite these achievements, understanding the determinants of LE in China remains an area of academic and policy interest. While numerous studies have examined factors influencing LE, most focus on economic determinants such as income levels and healthcare expenditures. However, LE is shaped by a complex interaction between economic and non-economic factors, both of which play vital roles. Economic determinants, including national income, income inequality, and financial investments in healthcare, directly affect the accessibility and quality of resources needed for better health. Non-economic determinants, such as education, environmental quality, and social cohesion, influence health indirectly by shaping behaviours, community structures, and institutional capabilities.

While economic and non-economic determinants are often studied in isolation, their comparison are equally important. For instance, higher income levels can facilitate investments in education and environmental protection, creating a cycle that promotes both economic and health outcomes. Conversely, poor environmental conditions or inadequate education systems can undermine the benefits of economic growth, limiting improvements in LE. Despite the growing body of research on LE, significant gaps remain. Much of the literature focuses on the various factors that impact life expectancy in China. This study seeks to fill these gaps by conducting a comparative analysis of economic and non-economic determinants of LE in China. It examines economic development and income inequality as economic factors and environmental quality and health facilities as critical non-economic factors. Through graphical trends, the research provides a comprehensive overview of how these determinants have shaped LE in China over time.

Literature review

Jiang *et al.*[6] explored the influence of social development on life expectancy in China from a spatio-temporal perspective. Drawing on data from the China Statistical Yearbooks (2000–2010) and employing geographically weighted regression analysis, the research examined 31 provinces across four dimensions of social development, identified through exploratory factor analysis. Findings indicated that healthcare and education development significantly improved life expectancy, with their effects varying geographically. Healthcare's impact decreased from south to north China, while education's influence declined from southwest to northeast and northwest China. The effects of eco-environment development and social harmony evolved over time, with differing spatial distributions in 2000 and 2010. The study concluded that the effects of social development on life expectancy vary by region and time, highlighting the need for region-specific and stage-specific strategies to enhance life expectancy and population health.

Luo and Xie[12] examined the relationship between economic growth, income inequality, and life expectancy in China. While China achieved significant health improvements prior to its 1978 economic reforms, subsequent rapid economic growth has been accompanied by rising income inequality and stagnating health gains. Using simulations, the study estimated that if income inequality had remained at its lowest post-1949 level, life expectancy could have increased for men by an additional 0.6 years and 0.4 years for women. The findings highlight income redistribution from wealthy to poorer populations as a critical policy tool for enhancing population health in China.

Li *et al.*[13] investigated factors influencing disparities in healthy working life expectancy (HWLE) in China, utilizing extensive longitudinal data. HWLE, representing the average number of years individuals remain healthy and employed from age 50 onward, was calculated at 6.87 years on average (95% CI: 6.70–7.04). The study highlighted pronounced inequities in HWLE influenced by gender, socioeconomic background, and geographic location. Among chronic conditions, hypertension

was the primary contributor to unhealthy working years (5.67 years for men and 4.85 years for women), while arthritis notably impacted occupational disparities, particularly between agricultural workers and corporate employees (3.28 years). Additionally, adopting healthier lifestyles was associated with HWLE increases of 2.13 years for men and 1.61 years for women. The authors recommend that a uniform approach to raising the pension age may be ineffective. Instead, inclusive policies targeting health promotion, work conditions, and pension reforms are essential to reduce inequities and enhance HWLE.

Uddin *et al*.[14] investigated the determinants of life expectancy in selected Asian countries (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka) over the period 2002–2020, The study investigated the effects of institutional quality, financial development, and environmental degradation, represented by carbon emissions and ecological footprint, on life expectancy. By applying advanced econometric approaches such as CIPS unit root tests, CS-ARDL, FMOLS, and DOLS, the research identified that institutional quality, financial development, and health expenditures significantly enhance life expectancy over the long term. On the other hand, factors like carbon emissions, ecological footprint, birth rate, mortality rate, and population growth were found to adversely impact life expectancy.

The findings show the importance of strengthening financial systems, increasing healthcare funding, adopting clean technologies, and implementing strict environmental policies to enhance life expectancy, improve human well-being, and support sustainable development goals

Methods

This study adopted a comparative analysis approach to investigate the economic and non-economic factors influencing life expectancy in China. Using a five-year interval of data spanning 2000 to 2020 from the United Nation's database and World Development Indicators (WDI) by World Bank, the research examined the relationships between economic determinants (economic development and level of employment) and life expectancy, as well as non-economic determinants (environmental quality and health facilities) and life expectancy.

Estimation procedures

To assess the connection between life expectancy, economic development, employment, environmental quality and healthcare facilities in China, this study employed GDP per capita and employment rate as economic factors determining life expectancy, and CO_2 emission and healthcare facilities served as proxy for the social factors. The measurement employed in this study are supported by studies such as Rahman *et al*.[15], Osei-Kusi *et al.*[16], Yan *et al*.[17], Lal[18], Zhang *et al*.[19], and Wang *et al*.[20]. Given the nature of this study, the chosen method for the comparative analysis was the use of graphs, which helps to provide a thorough understanding of the subject. Table 1

Data analysis

To achieve the objective of this study, the data analysis technique employed are graphs. The use of graphs enables the assessment and identification of patterns, trends, and changes in the data over time. This approach offers a comprehensive understanding of the study's subject matter. Additionally, descriptive statistics help to explain the distribution and patterns of the variables, with the mean value summarizing key insights.

Ethical considerations

This research employed statistical data made available on the World Development Indicators (WDI) and United Nations datasets, which are anonymized and aggregated, ensuring no risk of harm or exposure of identifiable information. No personal data were used, and the authors have strictly followed the conditions of use by data providers. The analyses were performed following a systematic, clear, and rigorous methodology, presenting the results in a transparent manner. Ethical approval was not required as no human or animal subjects were involved.

Results

Results of economic determinants

Figure 1 presents the relationship between economic development, as proxied by the growth in GDP per capita, and life expectancy in China from 2000 to 2020. During this period, GDP per capita growth was very volatile, while life expectancy increased steadily.

Table 1: Measurement of variables

Variable	Code	Measurement	Source
		Economic factors	
Economic development	GDPPC	GDP per capita growth (annual %)	WDI
Employment rate	EMP	Employment to population ratio, 15+, total (%) (modeled ILO estimate)	WDI
		Social Factors	
Environmental Quality	EQ	CO2 emissions (metric tons per capita)	WDI
Health facilities	HF	Hospital beds (per 1,000 people)	WDI
		Variable of Interest	
Life expectancy	LE	Life expectancy at birth, total (years)	UN-QOG-BD

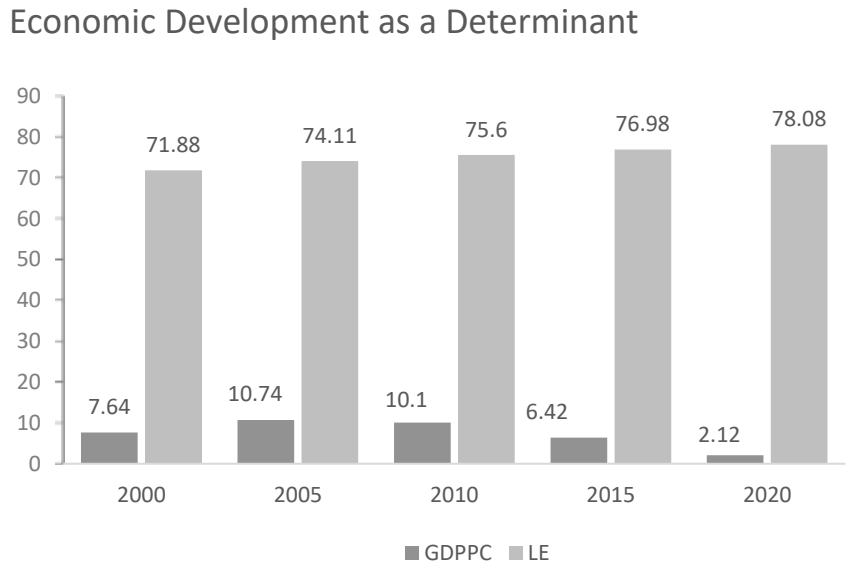

Figure 1: Economic development and life expectancy in China

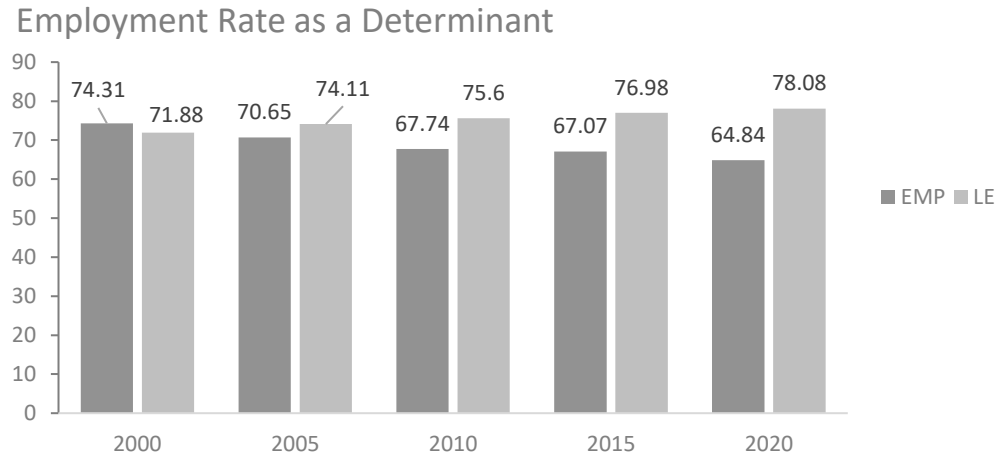

Figure 2: Employment rate and life expectancy in China

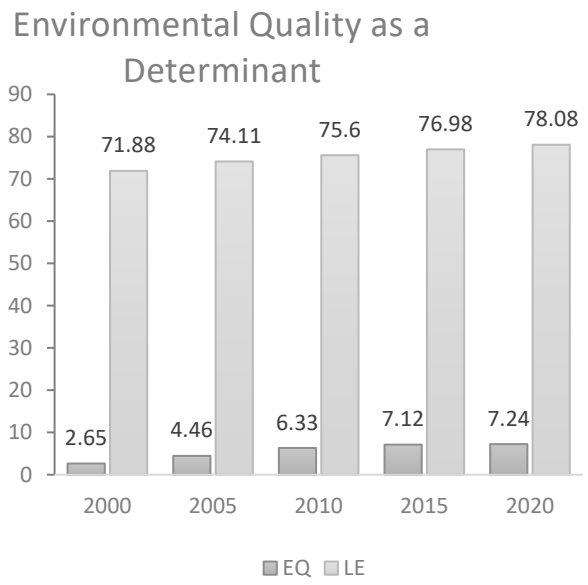

Figure 3: Environmental quality and life expectancy in China

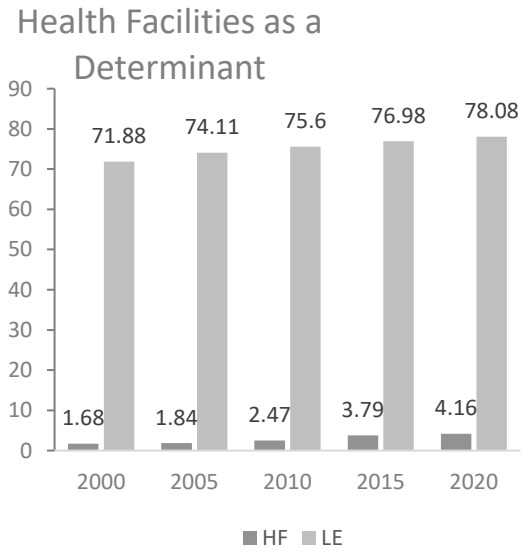

Figure 4: Relationship between health facilities and life expectancy in China

In this respect, China from 2000 to 2010 had been under fast economic growth with GDPPC reaching the highest point of 10.74% in 2005. In that same period, life expectancy surged upwards from 71.88 years in 2000 to 75.6 by 2010. Then again, starting from 2010, the rate of GDPPC declined suddenly to 6.42% in 2015 and 2.12% by 2020. This slowed growth has not deterred life expectancy from increasing, surging upwards to 76.98 in 2015 to reach 78.08 years in 2020.

Figure 2 below illustrates the trend in the employment (EMP) rate and life expectancy for China. While the EMP has fallen during the last two decades, the expectation of life continuously rose in the same period. It decreased from 74.31% in 2000 to 64.84% in 2020, showing the structural shift in the labor market of China because of urbanization, shifts from agriculture to service and technology sectors, and an aging population. On the contrary, life expectancy increased from 71.88 years in 2000 to 78.08 years in 2020, which indicates improvement in healthcare, nutrition, and social welfare.

Results of non-economic determinants

Figure 3 presents the association between environmental quality (EQ) and life expectancy (LE) in China over the period from 2000 to 2020. Over this five years interval period, CO_2 emissions increased significantly while life expectancy steadily improved. From 2000 to 2020, CO_2 emissions per capita rose from 2.65 metric tons in 2000 to 6.33 metric tons in 2010 and then 7.24 metric tons in 2020, highlighting China's growing energy consumption. During this time, life expectancy rose steadily from 71.88 years in 2000 to 78.08 years in 2020, reflecting continuous improvements in health outcomes and living standards.

Figure 4 highlights the relationship between health facilities (measured as hospital beds per 1,000 people, HF) and life expectancy (LE) in China from 2000 to 2020. During this period, the number of hospital beds per 1,000 people steadily increased, alongside a consistent rise in life expectancy. From 2000 to 2020, hospital beds per 1,000 people rose from 1.68 in 2000 to 2.47 in 2010 and then to 4.16 in 2020. Over the same period, life expectancy increased from 71.88 years in 2000 to 75.6 years in 2010, eventually reaching 78.08 years by 2020. The parallel growth of these two indicators suggests a possible strong relationship between the availability of health facilities and improvements in population health outcomes

Discussion

The robust economic growth between 2000 to 2005 bringing growth rate to 10.74 could have facilitated

investments in healthcare infrastructure, improved living standards, and enhanced access to clean water, sanitation, and nutrition, all of which contributed to increased life expectancy recorded in 2005 from 2000. This period highlights the direct effect of economic development on improving health outcomes and extending life spans. Despite the fall in economic development from 2010 to 2020, the life expectancy of the Chinese population increased in that same period which suggests that the long-term investments made during earlier periods of high economic growth had lasting effects on health of the populace. Improved healthcare systems, better public health policies, and advancements in medical technology likely played a pivotal role in sustaining gains in life expectancy, even in the face of slower economic growth.

Meanwhile, the inverse trend between the second economic determinant, employment, and life expectancy, reflects the evolving role of the employment rate as an economic determinant of life expectancy. The declining employment rate does not necessarily indicate a negative impact on life expectancy. In the early 2000s, the relatively high employment rate likely contributed to increased household income, access to healthcare, and better living conditions, all of which supported improvements in life expectancy. Yet, despite such a fall in the rate of employment, the tendency of life expectancy was still observed. This may suggest that employment is an influential determinant of life expectancy during the early stages of economic development but that its power gradually wanes as an economy matures and its people begin to depend on other more important factors, like quality health care and social securities.

The simultaneous rise in both emissions and life expectancy reflects an unexpected relationship between environmental quality and health outcomes during a period of rapid economic and social transformation. In the data, there was a decline in environmental quality-as represented by an increase in CO2 emission per capita-and a corresponding increase in life expectancy. China's increase in life expectancy during this period reflects the suggestion that government efforts to improve health care access, sanitation, and social services outpaced the effects of environmental degradation. However, as CO_2 emissions draw near to unsustainable levels, environmental quality becomes a critical determinant of public health. In the future, sustaining growth in life expectancy would depend on the balance between industrial activity and measures to reduce pollution through the transition to cleaner energy sources and stricter environmental regulations. The data shows that health facilities are important as a social determinant of life expectancy due to their roles in enabling access to medical care, effective treatment of diseases, and prevention healthcare services.

In the early 2000s, relatively low availability of beds in hospitals probably resulted in limited access to medical care in China, especially in rural areas. However, when the number of hospital beds grew over time, more people became able to access essential healthcare services and contributed to reductions in mortality rates and improvements in life expectancy. The steady improvement in health infrastructure reflects China's broader efforts to enhance healthcare accessibility and equity. These are particularly crucial investments in tackling challenges posed by the aging of the population and the increasing prevalence of chronic diseases. By ensuring more hospital beds and facilities are available, China has strengthened its capacity to provide both emergency and long-term care, directly influencing life expectancy growth.

Limitations

The study provides a broad analysis by examining both economic and non-economic determinants of life expectancy, offering an all-inclusive view of the factors influencing health outcomes in China. By analysing data over a 20-year period, it captures long-term trends and the enduring impacts of earlier investments, enhancing the robustness of its findings. The use of graphs and descriptive statistics effectively visualizes trends and simplifies relationships and comparison, making the results accessible.

Despite these strengths, the study has limitations. It limits its analysis to graphical associations and excludes other crucial control factors like education, lifestyle, and genetics, which may also influence life expectancy. Additionally, the national-level analysis hides regional disparities, overlooking variations in urban and rural health outcomes. The reliance on graphs and descriptive statistics limits the ability to draw causal inferences,

as correlations may not reflect direct impact. Lastly, the study's environmental analysis is narrow, focusing solely on
CO_2 emissions while neglecting other pollutants.

Policy implications

The results highlight the critical role of sustained economic investments in healthcare infrastructure, public health policies, and social services in improving life expectancy. Policymakers should prioritize maintaining and expanding healthcare access, particularly in rural areas, by increasing the availability of hospital beds and healthcare professionals.

Long-term investments in public health infrastructure can mitigate the impact of economic downturns on health outcomes. The inverse trend between employment rates and life expectancy underscores the need to focus on broader social security systems, including universal healthcare and pension schemes, to reduce dependency on employment as a determinant of health. As the economy matures, policies should shift towards enhancing the quality of healthcare and ensuring equitable access for vulnerable populations. The unexpected positive correlation between rising CO_2 emissions and life expectancy suggests that health improvements have outpaced environmental degradation. However, this balance may not be sustainable. Transitioning to cleaner energy sources and implementing stricter environmental regulations are crucial to safeguarding future health outcomes. Policymakers should integrate environmental sustainability into health and economic policies to ensure long-term gains in life expectancy.

Strength and weakness

This study provides a basis for analysing the economic and non-economic factors that affected life expectancy in China during the period 2000-2020. It also presents, using graphical analysis, a clear, accessible view of trends in life expectancy relative to economic development, employment, environmental quality, and health facilities. Looking at a long-term period of time, the study identifies a shift in life expectancy and indicates how these determinants could be driving factors in the general health status of the population. The study relies on trend graphs that could limit establishing causality relationships between life expectancy and the determinants under analysis. While the findings do present observable patterns among the variables, they may not fully capture other influences of macroeconomic variables or structural changes that may impinge on life expectancy. Further, the focus of this study on China limits the generalization of the findings, as the impact of economic and non-economic determinants of life expectancy may vary across regions and socio-economic contexts

Conclusion

The research studied the various determinants of life expectancy in China and underscored the relationship between economic and non-economic factors with life expectancy. Early gains in life expectancy were driven by GDP growth, enabling investments in healthcare, improved living standards, and essential resources, with long-term benefits persisting despite slower economic growth in later years. Employment trends showed the relationship whereby falling employment rates did not hinder the growth in life expectancy, reflecting the increasing influence of healthcare advancements and public policies in mature economies. Environmental quality presented an unexpected trend where life expectancy rose with CO_2 emissions, which means that improvements in healthcare and sanitation mitigated some environmental impacts. However, addressing environmental challenges remains crucial for sustained progress. Health facilities became a crucial non-economic factor, because better availability of hospital beds increased access and reduced mortality, thus making very significant contributions to the growth in life expectancy. It emphasizes that the economic development should be balanced with environmental protection and further investment in health infrastructure for future gains in life expectancy.

Acknowledgement

This work was sponsored by New Ph.D Special Fund of Party School of Liaoning provincial Party Committee. (2023BSJJ019)

References

1. Lei H, Li L, Liu X and Mao A. Quantitative study on socioeconomic Determinants of life expectancy in Beijing, China. *Journal of Evidence-Based Medicine*, 2009, *2*(2), 92-98.

2. Wang W, Liu Y, Ye P, Xu C, Qiu Y, Yin P ... and Zhou M. Spatial variations and social determinants of life expectancy in China, 2005–2020: a population-based spatial panel modelling study. *The Lancet Regional Health–Western Pacific*, 2022, *23*.
3. Wu Y, Hu K, Han Y, Sheng Q and Fang Y. Spatial characteristics of life expectancy and geographical detection of its influencing factors in China. *International Journal of Environmental Research and Public Health*, 2020, *17*(3), 906.
4. Deshpande R and Uttarkar V. Life Expectancy using Data Analytics. *International Journal for Research in Applied Science & Engineering Technology (IJRASET)*, 2023, 11, 972-978.
5. Zhou D, Bassey RA, Yan M and Aderemi TA. Do health expenditures affect under-five mortality and life expectancy in ECOWAS sub-Region. *African Journal of Reproductive Health*, 2023, 27(8), 105-113.
6. Jiang J, Luo L, Xu P and Wang P. How does social development influence life expectancy? A geographically weighted regression analysis in China. *Public health*, 2018, 163, 95-104.
7. Bayram A. The impact of economic indicators on life expectancy: A panel data analysis. *Istanbul Journal of Economics*, 2020, 70(1), 163-181.
8. Țarcă V, Țarcă E and Moscalu M. Social and Economic Determinants of Life Expectancy at Birth in Eastern Europe. In *Healthcare*, 2024, 12(11), 1148. MDPI.
9. Wang H, Abajobir AA, Abate KH, Abbafati C, Abbas KM, Abd-Allah F ... and Choi JYJ. Global, regional, and national under-5 mortality, adult mortality, age-specific mortality, and life expectancy, 1970–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*, 2017, *390*(10100), 1084-1150.
10. Tan X, Zhang Y and Shao H. Healthy China 2030, a breakthrough for improving health. *Global health promotion*, 2019, *26*(4), 96-99.
11. Chen H, Qian Y, Dong Y, Yang Z, Guo L, Liu J and Wang L. Patterns and changes in life expectancy in China, 1990-2016. *PLoS One*, 2020, 15(4), e0231007.
12. Luo W and Xie Y. Economic growth, income inequality and life expectancy in China. *Social science & medicine*, 2020, *256*, 113046.
13. Li C, Wang L, Ding L and Zhou Y. Determinants and inequities in healthy working life expectancy in China, 2024, *Nature Medicine*, 1-9.
14. Uddin I, Khan MA, Tariq M, Khan F and Malik ZK. Revisiting the determinants of life expectancy in Asia—Exploring the role of institutional quality, financial development, and environmental degradation. *Environment, Development and Sustainability*, 2024, *26*(5), 11289-11309.
15. Rahman MM, Rana R and Khanam R. Determinants of life expectancy in most polluted countries: Exploring the effect of environmental degradation. *PloS one*, 2022, 17(1), e0262802.
16. Osei-Kusi F, Wu C, Tetteh S and Castillo WIG. The dynamics of carbon emissions, energy, income, and life expectancy: Regional comparative analysis. *Plos one*, 2024, 19(2), e0293451.
17. Yang Y, Su X and Yao S. Nexus between green finance, fintech, and high-quality economic development: Empirical evidence from China. *Resources Policy*, 2021, *74*, 102445.
18. Lal B. The BRICS Countries: Trends of Demographic and Economic Development. *International Journal of Science and Research*, 2023, 12, 702-708.
19. Zhang H, Shi L, Yang J and Sun G. Efficiency and equity of bed utilization in China's health institutions: based on the rank-sum ratio method. *International journal for equity in health*, 2023, *22*(1), 177.

Wang Z, Dong L, Xing X, Liu Z and Zhou Y. Disparity in hospital beds' allocation at the county level in China: an analysis based on a Health Resource Density Index (HRDI) model. *BMC Health Services Research*, 2023, *23*(1), 1293.